

XIII.—Observations on the Larvæ of the Trematode Worms.

By Dr. P. DE FILIPPI*.

HAVING this summer pursued my investigations upon the Trematode worms in the larva state, I have succeeded in finding some new forms, and in adding to the results of my previous observations some details as to the mode of life of these creatures.

The *Paludina impura*, of which I have captured many individuals in different localities in the vicinity of Turin, has furnished me with three new species of these parasites:—

1. Some *Rediæ* producing Cercariæ of *Distomum*, very distinctly characterized by a tubercular body, and by the small ventral disk situated at the posterior third of the body, but especially by the bifurcate excretory organ, forming two large, lateral, twisted vessels, which ascend to the sides of the anterior sucking-disk. This species becomes encysted with the greatest facility, even on the stage of the microscope. It has shown me that in the formation of the cyst, after the concentric layers of mucosity exuded by the *Cercaria*, the skin of the latter assists, becoming detached, and forming the inner wall of the cyst itself.

2. A very fine *Cercaria* of *Monostomum*, furnished with large eyes in the form of two semi-lunar spots, with a tolerably strong pharyngeal bulb, and with a tail provided with a membranous crest. This species is produced from a very elongated *Redia*, without lateral appendages.

3. Some very peculiar nurses, almost identical in their organization, vital properties, and the form of the Cercariæ produced by them, with those found by M. Moulinié in the *Limaces*†. This is decidedly a third kind of nurse, very different from the two known up to this time, and for which I have reserved the names of *Sporocystis* and *Redia*. They present the form of a cylindrical sheath, with pretty thick walls, of which the narrowed anterior extremity forms a button or a head. This sheath is contractile; the head especially moves, and elongates and shortens itself, issuing from and re-entering a sort of collar. Notwithstanding this vitality which they enjoy, these sheaths did not present any vessels or intestines, or even a mouth. The cavity of the body is filled with Cercariæ, which, like those described and figured by M. Moulinié, are characterized by a very short tail, by a rounded excretory organ of

* Translated by W. S. Dallas, F.L.S., from the *Annales des Sciences Naturelles*, 4me série, tome vi. p. 83.

† *Mémoires de l'Institut Génèvois*, tome iii.

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considerable size, and by a very small, conical, buccal spine. These Cercariæ are contained in a sac or viscus with distinct proper walls.

At a later period I found in a *Lymnaus pereger* other similar sheaths, but less lively in their movements, and with a more granular tissue. They only contained germs; so that I should not mention them if they had not furnished me with an interesting observation which may throw some light on the nature of these creatures. In fact, in these sheaths, the internal sac, full of germs of Cercariæ, not only possessed very distinct walls, but in several it presented a more or less complete constriction, indicating a scission in course of taking place, without any participation of the external envelope forming the sheath properly so called. It follows from this, that these sheaths are not simple nurses or *Sporocysts*, but grand-nurses (*Grossammen*) or *Sporocystophores*, as the name of Sporocyst must be reserved for the internal sac filled with Cercariæ.

Although we are destitute of direct observations upon the development of these Sporocystophores, it is reasonable to suppose that in this respect also we shall find good reasons for considering them as a perfectly peculiar kind. In fact, the Sporocysts are produced by the direct metamorphosis of an infusoriform embryo; the Rediæ are procreated by a similar embryo, which soon afterwards dies and becomes decomposed. Probably the Sporocystophores correspond with the primitive embryo, which, after having undergone a transformation, would persist along with the Sporocyst procreated by it.

Planorbis carinatus furnished me with a second species of Redia, originating directly from true *Distoma*, and nearly analogous with those which I have already indicated as parasites of *Paludina impura**, but which arrive, in the Redia itself, at a still more advanced state of development, even presenting a rudiment of a generative system. The excretory organ, which is also very different, presents the form of a small contractile vesicle, in which the very delicate and tortuous vessels of each side of the body are clearly seen to terminate.

Lodged in the viscera of this *Planorbis* I also found an immense quantity of Sporocysts producing very large, armed Cercariæ, of a species not hitherto described, and distinguished at the first glance by their greatly developed excretory organ, which has a double outline, and is, as it were, trilobate. The ventral sucking-disk is larger than the anterior one; the two lateral

* Mémoire pour servir à l'histoire génétique des Trématodes, figs. 29-31, Turin, 1854; and Annales des Sciences Naturelles, tome ii. p. 255 (1854).

ducts which terminate at the spine originate from a very pretty bunch of secretory cells. This characteristic apparatus of the armed Cercariæ is not so well developed in any other species.

Amongst the Cercariæ which I have already made known in my previous works, and which I have again frequently seen in the course of this year, I shall mention particularly the *Cercaria virgula*, of which I have indicated the analogy with the *C. microcotyla*, parasitic on *Paludina vivipara**. I must now add, that in the form and dimensions of its Sporocysts, the *C. virgula* presents the same differences that I have found in the other allied species.

In some individuals of *P. impura*, the Sporocysts of *C. virgula* are large and elongated, and contain a considerable number of Cercariæ; in others, on the contrary, we only find small Sporocysts, usually of a rounded form, upon which we can see a sort of more or less apparent umbilicus, and which only contain a very small number of Cercariæ (3-4). These Cercariæ are exactly identical, both in form and organization, with those produced by the large Sporocysts; but their dimensions are much less, being reduced nearly to half. On examining a great many of these little Sporocysts, we soon see that they are the result of a scission of other larger ones; so that what I have just called an *umbilicus* really merits that name, because it corresponds with the spot at which the separation has taken place. The same difference between large and small Sporocysts exists in the *C. microcotyla* of *Paludina vivipara*, as I have pointed out elsewhere†, and this difference now receives its explanation. It is not impossible that these small Sporocysts and Cercariæ belong to different species from the analogous large Sporocysts and Cercariæ.

I have been struck this summer by the frequency (although the individuals were always few in number) of a Cercaria, which was first indicated by M. de la Valette under the name of *C. cristata*‡, and which never occurred to me in my previous researches. This singular creature, which I have met with in different species of Mollusca (*Valvata piscinalis*, *Paludina impura*, *Planorbis submarginatus*, *Lymnæus stagnalis*, *L. palustris*), is still the subject of a problem with me. If it be really a Cercaria, it can only be referred to a *Monostomum*.

In the month of August I passed a few days on the shore of the Mediterranean, with the view of making some investigations

* Second Mémoire pour servir à l'histoire génétique des Trématodes, p. 6. Turin, 1855.

† Mémoire, &c., p. 9. figs. 5, 6 (1854).

‡ Symbolæ ad Trematodum evolutionis historiam. Berlin, 1854.

on the parasites of the marine Mollusca. The locality beaten by the waves was by no means favourable, and I was only once able to find in the *Conus Mediterraneus* a fine flask-shaped Redia with a long, but usually retracted neck, a very large pharyngeal bulb, a short intestine, and a well-developed vascular system. I am compelled to confine myself to this mere indication, because the offspring which it contained was only in the state of germs.

XIV.—*Observations on the Development of the Star-fishes.*

By J. KOREN and D. C. DANIELSSEN*.

SARS was the first to make known to us the history of the development of the Star-fishes, in Wiegmann's *Archiv*, x. p. 169. Subsequently, in the 'Fauna Littoralis Norvegiæ,' p. 47, he furnished complete observations upon the *Echinaster sanguinolentus*, Müller, and the *Asteracanthion Mülleri*, Sars. Here he described minutely the external changes passed through by the embryo until it acquires the radiate form. Unfortunately, he did not succeed in explaining the internal organization. The Star-fishes observed by Sars belong to the section in which the development takes place without any peculiar larval apparatus.

A short time afterwards, Desor † published the history of the development of a Star-fish, which took place nearly in the same way as that described by Sars, except that in place of four clavate prehensile arms, there was only one, which was always ventral, and placed near the middle of the Star-fish. With regard to this organ, Sars and Desor are at variance. Sars supposed that the four prehensile arms left a cicatrix, which became the madreporic plate. Desor, on the contrary, regarded the claviform prehensile arm as a vitellary sac, which diminished in proportion as the little Star-fish increased in size, until at last it disappeared altogether.

Subsequently, Agassiz ‡ published his observations, which for the most part agree with those of Desor, although he does not say that the claviform stem becomes an appendage of the digestive organs. Agassiz says that he has seen the contents of the stem turn upon themselves. W. Busch § observed and

* Translated from the *Fauna Littoralis Norvegiæ*, Part ii. p. 55. By W. S. Dallas, F.L.S.

† *Proc. Boston Soc. Nat. Hist.* Feb. 15, 1848; Müller's *Archiv*, 1849, p. 79.

‡ *American Traveller*, Dec. 22, 1848; Müller's *Archiv*, 1851, p. 122.

§ *Beobachtungen über Anatomie und Entwicklung einiger wirbellosen Seethiere*, p. 77. Berlin, 1851.